

Abstract

Power electronic systems for controlling and converting electrical energy have become the workhorse of modern society in many applications. For example, power electronic systems play a dominant role in making more efficient use of electric power in many appliances, both in industry and at home. Power electronics plays a very important role in traction by enabling the use of electric cars and trains and can be considered as brawns of robotics and automated manufacturing systems. The importance of effective energy conversion control, including power generation from renewable and environmentally clean energy sources, increases due to rising energy demand.

Power semiconductor devices are the key electronic components used in power electronic systems. Advances in power semiconductor technology have improved the efficiency, size, weight and cost of power electronic systems and hence cost reductions are the important motivations for using better switching devices in a power converter.

At present, IGCTs, IGBTs, and MOSFETs represent modern switching devices. Power integrated circuits (PIC) have been developed for the use of power converters for portable, automotive and aerospace applications. For advanced applications, new materials (SiC and GaN) have been introduced.

This paper reviews the state of these devices and elaborates on their potentials in terms of higher voltages, higher power density, and better switching performance.